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Committee on the Peaceful Uses of Outer Space

Report of the Expert on Space Applications*

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* It was necessary to summarize in the report each of the activities organized under the United Nations Programme on Space Applications, the last of which was concluded on 30 November 2001.

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I. Introduction

1. At its thirty-eighth session, in 2001, the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space reviewed the activities of the United Nations Programme on Space Applications. The Subcommittee noted that the 2000 activities of the Programme had been carried out satisfactorily. On the recommendation of the Committee, the Programme for 2001 had been endorsed by the General Assembly in its resolution 55/122 of 8 December 2000.

2. The Subcommittee recommended to the Committee, for its approval, the activities scheduled for 2001 and noted the other activities of the Programme. All of the activities were to be implemented as part of those recommendations of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) related to space applications, as proposed by the Expert on Space Applications in his report (A/AC.105/730) submitted to the Scientific and Technical Subcommittee at its thirty-seventh session, in 2000. Summaries of the activities carried out within the framework of the Programme in 2001 and those scheduled for implementation in 2002 are presented in annexes I and II. The activities proposed for 2003 are presented below.

II. Mandate of the United Nations Programme on Space Applications

3. The General Assembly, in its resolution 37/90 of 10 December 1982, expanded the mandate of the United Nations Programme on Space Applications to include, in particular, the following elements:

(a) Promotion of greater exchange of actual experiences with specific applications;

(b) Promotion of greater cooperation in space science and technology between developed and developing countries as well as among developing countries;

(c) Development of a fellowship programme for in-depth training of space technologists and applications specialists;

(d) Organization of seminars on advanced space applications and new system developments for managers and leaders of space application and technology development activities as well as seminars for users in specific applications;

(e) Stimulation of the growth of indigenous nuclei and an autonomous technological base, in cooperation with other United Nations organizations and/or States Members of the United Nations or members of the specialized agencies;

(f) Dissemination of information on new and advanced technology and applications;

(g) Provision or arrangements for provision of technical advisory services on space applications projects, upon request by Member States or any of the specialized agencies.

4. In its resolution 55/122, the General Assembly noted that the Office for Outer Space Affairs of the Secretariat had submitted to the Committee for its review at its forty-third session a plan of action to implement the recommendations of UNISPACE III.[1] That plan of action contained a number of activities to be carried out under the Programme. In the same resolution, the Assembly requested the Secretary-General to begin implementing those measures and activities contained in the plan of action and currently within the programme of work of the Office for Outer Space Affairs and to ensure the full implementation of the plan with necessary resources in 2002. The activities to be carried out in 2002 under the Programme are in accordance with that request by the Assembly.

III. Orientation of the Programme

5. The United Nations Programme on Space Applications will be aimed at further promoting, through international cooperation, the use of space technologies and data for sustainable economic and social development in developing countries by raising the awareness of decision makers of the cost-effectiveness and additional benefits to be obtained; establishing or strengthening the capacity in developing countries to use space technology; and strengthening outreach activities to disseminate awareness of the benefits obtained.

6. The overall strategy of the Programme is to concentrate on a few themes of major importance for

developing countries and to establish objectives that can be achieved in the short and medium term. For each theme, individual activities will build on the results of previous activities aimed at achieving concrete results in a period of 1-3 years. The priority themes of the Programme as noted by the Committee at its forty-fourth session[2] are: (a) disaster management; (b) satellite communications for tele-education and telemedicine applications; (c) monitoring and protection of the environment; (d) management of natural resources; and (e) education and research areas in basic space sciences. Within each priority theme, the Programme would aim to achieve the following two objectives: (a) capacity-building; and (b) building awareness among decision makers in order to strengthen local support for the operational use of space technologies.[3] Other areas that the Programme would promote include developing capability in enabling technologies, such as the use of global navigation and positioning satellite systems, spin-offs of space technology, promoting the participation of youth in space activities, applications of small satellites and microsatellites and promoting the participation of private industry in activities of the Programme.[4]

7. The Committee, at its forty-fourth session, identified the recommendations of UNISPACE III that had been given highest priority. It also noted that for some of the recommendations, offers had been made by interested member States to exercise leadership in conducting the work associated with the recommendations. The Committee agreed to establish action teams to implement those recommendations under voluntary leadership of interested member States.[5] The activities of the Programme will support, to the extent possible, the action teams established by the Committee.

8. The activities of the Programme will concentrate on:

(a) Providing support for education and training for capacity-building in developing countries through the regional centres for space science and technology education and the Network of Space Science and Technology Education and Research Institutions for Central Eastern and South-Eastern Europe;

(b) Organizing workshops on advanced space applications and short- and medium-term training programmes;

(c) Strengthening its long-term fellowship programme to include support for the implementation of pilot projects;

(d) Promoting the participation of youth in space activities;

(e) Supporting or initiating pilot projects as follow-up to activities of the Programme in areas of priority interest to Member States;

(f) Providing technical advice, on request, to Member States, bodies and specialized agencies of the United Nations system and relevant national and international organizations;

(g) Enhancing access to space-related data and other information.

IV. Activities of the Programme

A. Support for disaster management

9. Within the framework of the United Nations Programme on Space Applications, regional workshops are being organized on the use of space technology in disaster management, in particular for the benefit of developing countries. The objectives of the workshops, which will support the work of the action team of the Committee on disaster management, are:

(a) To increase the awareness of managers and decision makers involved in disaster management of the potential benefits and the cost-effectiveness of using space technologies;

(b) To determine the types of information and communications needed in managing specific disasters and the extent to which they could be met by space technologies;

(c) To develop a plan of action that could lead in the near future to pilot projects that incorporate and demonstrate to decision makers the use of space tools in disaster management.

10. The first of the workshops was held for the benefit of countries in Latin America and the Caribbean in November 2000. The second and third

workshops are to be held for the benefit of countries in Africa and in Asia and the Pacific respectively. The workshop schedule is contained in annex II.

B. Promoting the use of enabling technologies

11. Global navigation satellite systems (GNSS) are a new global instrument offering increasing benefits in people's daily lives. The benefits of GNSS applications are growing in such areas as aviation, maritime and land transportation, mapping and surveying, agriculture, power and telecommunications networks, and disaster warning and emergency response, to name a few. Particularly for developing countries, GNSS applications offer cost-effective solutions to problems encountered in pursuing economic and social growth.

12. For 2002, four regional workshops have been organized within the framework of the United Nations Programme on Space Applications that will focus on issues of common concern and interest to each region. The conclusions and recommendations of all the regional workshops will be reviewed at an international meeting by a group of experts for possible further action (see annex II).

C. Development of indigenous capability

13. The efforts of the United Nations Programme on Space Applications in developing indigenous capability have focused, in large part, on the establishment of regional centres for space science and technology education in developing countries and a Network of Space Science and Technology Education and Research Institutions for Central Eastern and South-Eastern Europe. The Programme continues to emphasize cooperation with Member States at the regional level aimed at establishing and supporting the centres and the network.

14. At its thirty-eighth session, in 2001, the Scientific and Technical Subcommittee had before it a document (A/AC.105/749) containing information received by the Office for Outer Space Affairs on the activities conducted by the regional centres and the Network since their establishment, as well as their activities planned for 2001 and beyond. The highlights of the activities of the regional centres that were supported under the Programme in 2001 are summarized below.

1. Africa

15. In 2001, a nine-month course on satellite communications was completed at the African Regional Centre for Space Science and Technology—in French Language. The Programme was also represented in the meeting of the Governing Board of the Centre held in Rabat on 30 October 2001. The second nine-month course on remote sensing and geographic information systems (GIS) started in November 2001 while the second course on satellite meteorology started in January 2002.

16. The second course on remote sensing and GIS started in November 2001 at Ile-Ife, Nigeria, at the African Regional Centre for Space Science and Technology Education—in English Language.

2. Asia and the Pacific

17. Since its establishment in 1995, the Centre for Space Science and Technology Education in Asia and the Pacific has held 11 nine-month postgraduate courses: five courses on remote sensing and GIS, two courses on satellite communications, two courses on satellite meteorology and two courses on space science. The sixth nine-month postgraduate course on remote sensing and GIS began on 1 October 2001. In 2002, the Centre plans to hold the following courses: (a) the third nine-month postgraduate course on satellite meteorology, at the Space Applications Centre in Ahmedabad, India; (b) an international course on remote sensing and GIS technology applications in natural resources and environmental management, at the Indian Institute of Remote Sensing in Dehra Dun, India; (c) the third nine-month postgraduate course on space science, at the Physical Research Laboratory in Ahmedabad; (d) the seventh nine-month postgraduate course on remote sensing and GIS, at the Indian Institute of Remote Sensing in Dehra Dun; (e) a short-term course and workshop on satellite meteorology, at the Space Applications Centre in Ahmedabad.

3. Western Asia

18. The United Nations Programme on Space Applications has continued to provide technical support to the Government of Jordan in its preparations for the establishment in Jordan of the regional centre

for space science and technology education for western Asia. A planning meeting for the inauguration of the centre is to take place in the second half of 2002, after a draft agreement to establish the centre has been formulated and circulated to States in western Asia.

D. Long-term fellowship programmes for in-depth training

19. Under the long-term fellowship programmes for in-depth training of the United Nations Programme on Space Applications, two six-month fellowships for research in remote-sensing technology tenable at the European Space Research Institute facilities of the European Space Agency (ESA) in Frascati, Italy, for the period 2001-2002, are allowing university educators from Tribhuvan University in Nepal and the Open University of Sri Lanka to improve their skills. Both educators had participated in the United Nations/Sweden series of courses.

20. For the period 2001-2002, ESA is also offering, through the Programme, three fellowships, each for a period of one year, at the European Space Research and Technology Centre at Noordwijk, Netherlands. The fellowships, for research and study in Communications Systems, in Space Antennas and Electromagnetics and in Remote Sensing Instrumentation, will benefit participants from the China Telecommunications Broadcast Satellite Corporation, the Ho Chi Minh City Institute of Physics of Viet Nam and the Defence Engineering College of Ethiopia.

E. Technical advisory services and promotion of regional cooperation

21. Various technical advisory services currently being provided, as well as activities that promote regional cooperation that are co-sponsored under the auspices of the United Nations Programme on Space Applications, are described below.

1. Follow-up activities of the United Nations/European Space Agency workshops on basic space science

22. Since 1991, when the series of United Nations/European Space Agency workshops on basic space science began, the workshops have provided researchers and educators from developing countries with knowledge about and new ways and means of conducting basic space science.

23. Recent accomplishments of the activities to follow up the series of workshops on basic space sciences include the distribution of regional astronomical newsletters, through the World Wide Web and in hard copy, on a regular basis, as recommended by the workshop held in 1996. For Africa, through collaboration between the South African Astronomical Observatory and the Observatoire Midi-Pyrénées of France, the regional newsletter "African Skies/Cieux Africains" is being published and is available at http://www.saao.ac.za/~wgssa. For Asia and the Pacific, the National Astronomical Observatory of Japan publishes the regional newsletter "Teaching of Astronomy in Asia-Pacific Region". For Latin America and the Caribbean, the regional newsletter "Astronomia Latino Americana" is being published by the Universidad de Guanajuato of Mexico and is available at http://www.astro.ugto.mx/~aia/.

2. Asia-Pacific Satellite Communications Council

24. Since its establishment in 1994, with the assistance of the United Nations Programme on Space Applications, the Asia-Pacific Satellite Communications Council (APSCC) has grown considerably; it currently has 90 members from 31 countries. APSCC has played a key role in promoting the development of and cooperation in satellite communications in Asia and the Pacific by providing a platform for the exchange of views and ideas on new technologies, systems, policies and satellite communication services. Based in Seoul, APSCC organizes the Asia-Pacific Satellite Communication Conference and Exhibition for Global Communications on a biennial basis and has become a regional body for the satellite communications industry. The Programme provided technical advice to APSCC in 2001 and will continue to support its work in 2002.

3. American Institute of Aeronautics and Astronautics

25. The Office for Outer Space Affairs co-sponsored the sixth Workshop on International Space Cooperation, organized by the American Institute of Aeronautics and Astronautics under the theme

"International space cooperation: addressing challenges of the new millennium". The Office contributed to the planning of the discussions during the Workshop, which was held in Seville, Spain, from 11 to 15 March 2001. Through the United Nations Programme on Space Applications, the Office defrayed the costs of air travel and living expenses of four participants from developing countries. The findings and recommendations emanating from the Workshop concerned such issues as future needs for the management of space traffic, Earth-threatening asteroids and comets, GNSS, links between space and the public, and the contribution of space systems to the implementation and verification of international environmental agreements.

4. XX Plenary Meeting of the Sociedad de Especialistas Latinoamericanos en Percepción Remota

26. The United Nations Programme on Space Applications will co-sponsor the XX Plenary Meeting of the Sociedad de Especialistas Latinoamericanos en Percepción Remota (SELPER) and X Latin American Symposium on Remote Sensing, to be held at La Paz from 10 to 15 November 2002. The Programme is contributing to the planning of the Meeting and the Symposium, whose theme will be "Meeting the needs of users and decision makers: towards operational applications of Earth observation and data collection systems".

5. Conference on the theme "Under African skies"

27. A conference on the theme "Under African skies", held in Lusaka in June 2001, was scheduled to coincide with the first total solar eclipse of the millennium. The conference was organized by members of the Space Generation Advisory Council to promote interest in education and research in space science and technology among the 300 young Africans who participated in the event. A representative of the Office for Outer Space Affairs made a presentation on international cooperation in space and on the role of the Space Generation Forum of UNISPACE III.

6. Committee on Earth Observation Satellites

28. The 15th plenary meeting of the Committee on Earth Observation Satellites (CEOS) was held in Kyoto, Japan, from 6 to 7 November 2001. During the meeting, a representative of the Office for Outer Space Affairs made a presentation on the progress made by the Committee on the Peaceful Uses of Outer Space and its Scientific and Technical Subcommittee in implementing the recommendations of UNISPACE III, in particular through the action teams established by the Committee under the voluntary leadership of Member States. The representative informed CEOS that the Committee had encouraged the action teams to actively consider the participation of non-governmental entities in their work. The representative also described action taken under the United Nations Programme on Space Applications related to training and education for capacity-building and other action being undertaken or planned in areas of priority, such as disaster management.

29. At its 15th plenary meeting, CEOS noted the cooperation between its ad hoc Disaster Management Support Group, the secretariat of the International Strategy for Disaster Reduction and the Office for Outer Space Affairs, including the plans for holding joint regional workshops on the use of space technology in disaster management. CEOS decided to co-sponsor two regional workshops on the subject to be held in 2002, for Africa and for Asia and the Pacific. Regarding follow-up action of UNISPACE III, CEOS noted that some action teams, such as the one relating to disaster management, had already started their work. CEOS agreed that its participation in follow-up action of UNISPACE III was important and decided to seek permanent observer status with the Committee in order to be better informed of the developments in the work of the Committee in that regard.

7. Follow-up activities of training courses sponsored by the United Nations and the European Space Agency

30. Under the United Nations Programme on Space Applications emphasis continues to be placed on collaboration with the Department of Economic and Social Affairs of the Secretariat and ESA in implementing follow-up projects of the training courses on applications of data from the European remote sensing satellite (ERS) and other satellites to natural resources, renewable energy and the environment that were held in Frascati, Italy, in 1993, 1994, 1995 and 1997. In 2001, a pilot project in Viet Nam (for Asia and the Pacific) was completed and its

results presented to decision makers in the General Department of Land Administration of Viet Nam. Work continued on projects in Latin America (Argentina, Bolivia and Chile) and in Africa (Burkina Faso and the Regional Training Centre for Agrometeorology and Operational Hydrology and Their Applications (AGRHYMET)).

F. Training courses, workshops, conferences and symposia organized by the United Nations

1. Activities carried out in 2001

31. In 2001, six workshops, one training course, one meeting of experts and one symposium were conducted under the auspices of the United Nations Programme on Space Applications. A summary of each of the activities is given in annex I to the present report.

2. Activities scheduled for implementation in 2002

32. The training courses, workshops, meetings and symposia scheduled for 2002 are shown in annex II.

3. Activities proposed for implementation in 2003

33. The following activities are proposed for 2003:

(a) Thirteenth United Nations/Sweden International Training Course on Remote Sensing Education for Educators, to be held in Stockholm and Kiruna, Sweden, in May-June 2003;

(b) United Nations/Austria Symposium on the Operational Use of Space Technology in Sustainable Development, to be held in Graz, Austria, in September 2003;

(c) United Nations/International Astronautical Federation Workshop on the Use of Space Technology for the Benefit of Developing Countries, to be held in Bremen, Germany, in September-October 2003;

(d) Twelfth United Nations/European Space Agency Workshop on Basic Space Science, for the benefit of developing countries in Asia and the Pacific;

(e) United Nations workshop on remote sensing applications for the benefit of developing countries in western Asia;

(f) United Nations/European Space Agency Workshop on the Use of Space Technology in Disaster Management, for the benefit of countries in western Asia, to be held in Lebanon.

G. Space information

34. Information for Member States and the general public on the latest developments in the activities carried out under the United Nations Programme on Space Applications can be found on the web site of the Programme (http://www.oosa.unvienna.org/sapidx.html), which is part of the web site of the Office for Outer Space Affairs. It contains information on activities that have been implemented as well as reports and press releases issued within the framework of the Programme. The schedules, objectives and programmes of planned activities and projects are also included on the web site.

35. The updated directory entitled *Education, Training, Research and Fellowship Opportunities in Space Science and Technology and Its Applications* (ST/SPACE/10) has been published. The directory has also been made available on the web site of the United Nations Programme on Space Applications.

36. The thirteenth in the series of publications, containing selected papers from the activities of the Programme, entitled *Seminars of the United Nations Programme on Space Applications* (ST/SPACE/7), has been issued.

V. Voluntary contributions

37. The successful implementation of the activities of the United Nations Programme on Space Applications in 2001 benefited from the support and voluntary contributions of Member States and their institutions, as well as from the assistance and cooperation of regional and international governmental and non-governmental organizations. In 2001, the Programme received voluntary contributions, both in money and in kind, including the sponsorship of technical and scientific presentations by experts, as described below.

38. A number of Member States and governmental and non-governmental organizations provided support for the activities of the United Nations Programme on

Space Applications in 2001 in various ways, including the following:

(a) A voluntary cash contribution of $3,000 from the Government of the Czech Republic, in support of the activities of the Programme, and 150,000 francs from the Government of France for activities relating to natural disasters;

(b) A financial contribution of $110,000 from ESA and 50,000 francs from the Centre national d'études spatiales of France in support of specific activities of the Programme in 2001 that they co-sponsored (see annex I);

(c) Defrayal by the Government of Sweden of the costs of international air travel for 13 participants, local organization and facilities, room and board, and local transportation in respect of a training course organized in Stockholm and Kiruna, Sweden (see annex I);

(d) Defrayal by the Government of Austria (the Ministry for Foreign Affairs and the Ministry for Transport, Innovation and Technology), the State of Styria and the City of Graz of the costs of international air travel of participants, local organization and facilities, room and board, and local transportation in respect of a symposium organized in Graz (see annex I);

(e) A financial contribution of $500,000 from the Government of the United States of America to co-sponsor four workshops and a meeting of experts on the use of global navigation satellite systems in 2001 and 2002 (see annexes I and II);

(f) A financial contribution of $20,000 from the European Commission to co-sponsor a workshop on the use of GNSS in 2001 (see annex I);

(g) Defrayal, by the host Governments of activities of the Programme, of the costs of local organization and facilities, room and board for some participants from developing countries and local transportation (see annex I);

(e) Sponsorship of experts by Member States and their space-related institutions, as well as by regional and international organizations, to make technical presentations and take part in deliberations during activities of the Programme (see annex I).

VI. Financial provisions and administration of activities in the biennium 2002-2003

39. The activities of the United Nations Programme on Space Applications in 2002 covered in the present report will be implemented as follows:

(a) *Financial provisions.* Under the regular budget of the United Nations, an amount of $510,200 before recosting was approved as resource requirements for fellowships and grants in the programme budget by the General Assembly, at its fifty-sixth session, for implementing the activities of the Programme during the biennium 2002-2003. An amount of $282,800, which has been appropriated from this budget after recosting, will be used to implement the activities of the Programme in 2002. In order to effectively carry out its mandated and expanded activities, particularly those aimed at implementing the recommendations of UNISPACE III, the Programme must solicit additional funds, in the form of voluntary contributions, in support of its activities. Those contributions will be used to supplement the regular budget of the Programme;

(b) *Administration by and contributions and participation of staff.* The Office for Outer Space Affairs and, in particular, the Expert on Space Applications and his staff will carry out the activities described in the present report. In that connection, travel will be undertaken as appropriate by the Expert and the staff of the Office under the provisions of the travel budget of the Office for the biennium and as may be necessary from voluntary contributions.

Notes

[1] *Official Records of the General Assembly, Fifty-fifth Session, Supplement No. 20* (A/55/20), para. 71.

[2] Ibid., *Fifty-sixth Session, Supplement No. 20* and corrigendum (A/56/20 and Corr.1), para. 69.

[3] Ibid., para. 68.

[4] Ibid., para. 69.

[5] Ibid., paras. 50-55.

Annex I

Summary of United Nations training courses, workshops and conferences held in 2001

1. Fourth United Nations/European Space Agency/Committee on Space Research Workshop on Data Analysis and Image-Processing Techniques (Damascus, 25-29 March 2001)

Sponsoring country: Syrian Arab Republic

Sponsoring organizations: the United Nations, European Space Agency (ESA), Committee on Space Research

Host institutions: General Organization of Remote Sensing (GORS) of the Syrian Arab Republic

Funding support: Air travel and living expenses for 20 participants were covered by the United Nations, ESA and GORS.

Number of countries: 15

Total number of participants: 56

Outcome of the activity

The workshop was organized for the benefit of western Asia. Individuals from the regional centres for space science and technology education, affiliated to the United Nations, that are located in India, Morocco and Nigeria and the one to be inaugurated in Jordan also participated in and contributed to the workshop. Presentations and discussions focused on data analysis and image processing in the areas of remote sensing, geographic information system (GIS), photogrammetry, and their applications in natural resources management, particularly monitoring water resources, desertification, land use, environmental pollution, and ecosystem changes in arid areas. Participants used the opportunity to undertake practical work at the facilities of GORS, including its meteorological station, chemical laboratory, aerial photographs and space images laboratory, visual interpretation laboratory and digital processing laboratory. The workshop fostered communication and cooperation among participants, particularly from Arab countries.

(A detailed report on the training course is contained in document A/AC.105/765 and Corr.1.)

2. Eleventh United Nations/Sweden International Training Course on Remote Sensing Education for Educators (Stockholm and Kiruna, Sweden, 2 May-9 June 2001)

Sponsoring country: Sweden

Sponsoring organization: United Nations

Host institutions: Stockholm University and Satellus AB of Metria and the National Land Survey of Sweden

Funding support: Air travel expenses for 13 participants were defrayed by the United Nations; all other expenses, including room and board and local travel, were covered by the Swedish International Development Cooperation Agency (Sida).

Number of countries: 22

Total number of participants: 26

Outcome of the activity

The course was conducted specifically for the benefit of university educators from developing countries with the objective of developing their knowledge and skills in remote sensing technology and enabling them to introduce elements of the technology, as appropriate, in the academic curricula of their universities and institutes.

The Office for Outer Space Affairs of the Secretariat and Stockholm University conducted a global survey on the impact of the training courses held in the period from 1990 to 2000. The results of the survey indicated that the participants had been applying the knowledge that they had gained in the courses to enhance educational programmes in remote sensing and GIS at their institutions. The results also indicated the need for supplementary training in advance disciplines, such as digital data processing, GIS, global navigation satellite systems (GNSS) and use of high-resolution satellite images and data.

(A detailed report on the training course is contained in document A/AC.105/767.)

3. Tenth United Nations/European Space Agency Workshop on Basic Space Science: Exploring the Universe; Sky Surveys, Space Exploration and Space Technologies (Reduit, Mauritius, 25-29 June 2001)

Sponsoring country: Mauritius

Sponsoring organizations: the United Nations, ESA, the Centre national d'études spatiales (CNES) of France, the German Space Agency (DLR), the National Aeronautics and Space Administration (NASA) of the United States of America, the National Astronomical Observatory of Japan and the Planetary Society

Host institution: University of Mauritius

Funding support: Air travel and living expenses for 18 participants were covered by the United Nations and ESA.

Number of countries: 28

Total number of participants: 65

Outcome of the activity

The participants presented their research findings, status reports on their research, and project proposals. The space scientists from Mauritius presented to the international community, for the first time, results emanating from the Mauritius Radio Telescope, a collaborative effort of India and Mauritius. Taking into account the recommendations of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) and the past United Nations/European Space Agency workshops on basic space science, participants split into working groups to elaborate on the following four major topics covered by the programme: (a) space exploration, (b) sky surveys, (c) education, training and services and (d) space technologies.

The working groups developed, individually and collectively, a set of observations and recommendations to chart the future course of workshops of this nature. The working groups also initiated an evaluation of the achievements of the United Nations/European Space Agency workshops on basic space science in the period from 1991 to 2000.

(A detailed report on the symposium is contained in document A/AC.105/766.)

4. First United Nations/United States of America Workshop on the Use of Global Navigation Satellite Systems (Kuala Lumpur, 20-24 August 2001)

Sponsoring country: Malaysia

Sponsoring organizations: the United Nations and the Government of the United States

Host institution: Department of Survey and Mapping Malaysia, Ministry of Land and Cooperative Development of Malaysia

Funding support: Air travel and living expenses for 27 participants were covered by the Government of the United States. The Government of Malaysia provided the meeting facilities and board for all the funded participants.

Number of countries: 23

Total number of participants: 206

Outcome of the activity

The participants of the workshop were briefed on the modernization policy of the Global Positioning System (GPS) of the United States, as well as the current status and future developments of the Global navigation Satellite System (GLONASS) of the Russian Federation. The workshop reviewed existing and potential applications of GNSS for promoting sustainable development and protecting the environment for the benefit of countries in Asia and the Pacific. The participants stressed the need to strengthen regional cooperation in the use of GNSS and to avoid duplication of efforts in GNSS-related projects that are being carried out in the region.

(A detailed report on the workshop is contained in document A/AC.105/771.)

5. United Nations Meeting of Experts on the Regional Centres for Space Science and Technology Education: Status and Future Developments (Frascati, Italy, 3-7 September 2001)

Sponsoring organizations: the United Nations and ESA

Host institution: European Space Research Institute (ESRIN) of ESA

Funding support: Air travel and living expenses for 20 participants were covered by the United Nations and ESA.

Number of countries: 19

Total number of participants: 33

Outcome of the activity

The experts reviewed the operation and establishment of the regional centres for space science and technology education with a view to enhancing cooperation among the centres. The experts focused on the management of the centres and updated their curricula in the following fields: (a) remote sensing; (b) satellite meteorology; (c) satellite communication; and (d) space science. The updated education curricula will be provided to the regional centres that have been inaugurated in India for Asia and the Pacific, in Morocco and Nigeria for Africa and in Brazil and Mexico for Latin America and the Caribbean. The curricula of the centre to be inaugurated in Jordan for western Asia would also include these fields. In updating the curricula, the experts took into account the results of the past nine-month postgraduate courses organized since 1996 at the centre in India and since 1998 at the centres in Morocco and Nigeria.

(A detailed report on the meeting, including the updated curricula, will be issued in time for the forty-fifth session of the Committee on the Peaceful Uses of Outer Space.)

6. Second United Nations/Austria/European Space Agency Symposium on Enhancing the Participation of Youth in Space Activities (Graz, Austria, 17-20 September 2001)

Sponsoring country: Austria

Sponsoring organizations: the United Nations and ESA

Host institution: Research Centre Graz of the Austrian Academy of Sciences

Funding support: Air travel and living expenses for 29 participants were covered by the Government of Austria (the Ministry for Foreign Affairs and the Ministry for Transport, Innovation and Technology), the State of Styria, the City of Graz and ESA.

Number of countries: 35

Total number of participants: 76

Outcome of the activity

The participants were provided with an overview of the mechanisms, activities and programmes through which young people could benefit from and contribute to space activities for the benefit of humanity. These included such mechanisms as the Space

Generation Advisory Council in support of the United Nations Programme on Space Applications, which has been granted observer status with the Committee on the Peaceful Uses of Outer Space. The main issues addressed in the symposium included education and outreach activities. The results and progress on some of the activities and projects of the Space Generation Advisory Council that were initiated as a result of the symposium held in 2000 were presented to the participants of this Symposium. Through the discussions in working groups, the participants identified issues of importance to each region that they represented. They also examined additional projects that could serve to implement some of the recommendations contained in "The Space Millennium: Vienna Declaration on Space and Human Development", adopted by UNISPACE III, and in the report of the Space Generation Forum, organized by and for young professionals and students during UNISPACE III.

(A detailed report on the symposium is contained in document A/AC.105/774.)

7. United Nations/International Astronautical Federation Workshop on Making Space Applications Operational: Opportunities and Challenges for Sustainable Development (Albi, France, 27-29 September 2001)

Sponsoring country: France

Sponsoring organizations: the United Nations, the International Astronautical Federation (IAF), ESA and CNES

Host institution: Ecole des Mines in Albi, France

Funding support: Air travel and living expenses for the period of the workshop and the fifty-second International Astronautical Congress, as well as registration fees for the Congress for 21 participants, were covered by the United Nations, IAF, ESA and CNES.

Number of countries: 30

Total number of participants: 62

Outcome of the activity

The participants noted that the following would be necessary for the greater operational use of space technologies in projects to promote sustainable development: (a) awareness of decision makers and programme managers of the usefulness of space technologies to support development projects; (b) funding dedicated to the use of space technologies; and (c) sufficient local capacity to use space-related technologies. The workshop included three case studies of successful projects that addressed local or national needs with the use of space technology and received funding support. One meeting was dedicated to funding and financing strategies and included presentations by the Inter-American Development Bank, the African Development Bank and the Canadian International Development Agency. The participants provided guidelines to follow in order to improve the possibilities of securing funding for pilot or operational projects and programmes.

(A detailed report on the workshop is contained in document A/AC.105/775.)

8. United Nations/International Academy of Astronautics Workshop on Small Satellites at the Service of Developing Countries: the African Perspective (Toulouse, France, 2 October 2001)

Sponsoring country: France

Sponsoring organizations: the United Nations and the Subcommittee on Small Satellites for Developing Nations of the International Academy of Astronautics (IAA)

Funding support: The workshop was held as part of the fifty-second International Astronautical Congress and was open to all participants of the Congress; therefore, no additional funding was required.

Total number of participants: approximately 55

Outcome of the activity

The workshop was organized within the framework of the fifty-second International Astronautical Congress. While the workshop was open to all participants of the Congress, the situation in Africa was used as an example of the benefits of small satellites for developing countries. The workshop participants reviewed the advancements made in Africa in the development and utilization of small satellites in the light of the recommendations made by previous workshops organized by the IAA Subcommittee on Small Satellites for Developing Nations.

The workshop recognized the very significant spin-off benefits to be gained by initiating space activities with small satellite programmes. Small satellite projects are contributing to the enhancement of international cooperation within Africa. The workshop stressed the importance of applications that provide sustainable economic benefits for countries in Africa, for example, in the fields of disaster mitigation, agriculture, monitoring of desertification and forest resources.

(A detailed report on the workshop is contained in document A/AC.105/772.)

9. Second United Nations/United States of America Regional Workshop on the Use of Global Navigation Satellite Systems (Vienna, 26-30 November 2001)

Sponsoring country: United States of America

Sponsoring organizations: the United Nations, the European Commission and the Austrian Space Agency

Host country and institution: Austria and the Austrian Space Agency

Funding support: Full or partial air travel and living expenses for 49 participants were defrayed by the Government of the United States and the European Commission. The Government of Austria provided the meeting facilities.

Number of countries: 33

Total number of participants: 146

Outcome of the activity

More than 40 policy makers, programme managers and researchers of government agencies, research institutes and universities as well as industry engaged in such fields as environment protection, agriculture, transport, cartography and geodesy participated in the workshop. Through more than 40 technical presentations, they were briefed on the latest status of the existing and planned GNSS and their augmentation systems. They were also briefed on the latest applications of GNSS technology in environmental monitoring, precision agriculture, geodesy, cartography, as well as air, maritime and land transportation. For the participants from eastern Europe, the workshop served as a forum in which to exchange views and establish direct contact with policy makers and experts in the use and applications of GNSS from the United States, western European countries and other developed countries.

The participants recognized the need to ensure the compatibility among GPS of the United States, GLONASS of the Russian Federation and the planned Galileo system of European countries. The participants stressed that user needs and requirements must be fully taken into account in the development phase of Galileo. The participants identified capacity-building, financial resources to establish the necessary infrastructure and coordination at all levels as essential elements to further increase the use and various applications of GNSS technology in eastern Europe. The participants accorded high priority to the need to protect GNSS signals from unwanted frequency interference.

(A detailed report on the workshop will be contained in document A/AC.105/776, to be presented to the Committee on the Peaceful Uses of Outer Space at its forty-fifth session.)

Annex II

United Nations Programme on Space Applications: schedule of training courses, workshops, conferences and symposia for implementation in 2002

Activity	*Title*	*Place (and date)*	*Objective*
1	United Nations Workshop on Satellite-Aided Search and Rescue	Bangalore, India (18-22 March 2002)	To promote the use of the International Search and Rescue Satellite System (COSPAS-SARSAT) for countries in Asia and the Pacific
2	Third United Nations/United States of America Regional Workshop on the Use of Global Navigation Satellite Systems	Santiago (1-5 April 2002)	To promote the use of global navigation and positioning satellite systems in development activities; for countries in Latin America and the Caribbean
3	Twelfth United Nations/ Sweden International Training Course on Remote Sensing Education for Educators	Stockholm and Kiruna, Sweden (2 May-8 June 2002)	To enable university professors from developing countries in all regions to include remote sensing in their curricula
4	Fourth United Nations/United States of America Regional Workshop on the Use of Global Navigation Satellite Systems	Lusaka (15-19 July 2002)	To promote the use of global navigation and positioning satellite systems in development activities; for countries in Africa
5	United Nations/South Africa/ European Space Agency Workshop on the Use of Space Technology in Sustainable Development, co-sponsored by Astrium	Stellenbosch, South Africa (August 2002)	To appraise high-level policy makers of the benefits of space applications in promoting sustainable development
6	Eleventh United Nations/ European Space Agency Workshop on Basic Space Science	Cordoba, Argentina (9-13 September 2002)	To review follow-up activities of previous workshops in this series and decide on further action; for countries in Latin America and the Caribbean
7	Third United Nations/Austria Symposium/European Space Agency on Enhancing the Participation of Youth in Space Activities	Graz, Austria (September 2002)	To review follow-up activities of the symposium in this series held in Graz in September 2001 and to decide on new action; for the benefit of young people from all regions

Activity	*Title*	*Place (and date)*	*Objective*
8	United Nations/Economic Commission for Africa/ European Space Agency/ Committee on Earth Observation Satellites Workshop on the Use of Space Technology in Disaster Management, for the benefit of Africa	Addis Ababa (June 2002)	To identify disaster of concern to Africa and to propose possible pilot projects to enhance disaster management with the use of space technology
9	United Nations/International Astronautical Federation workshop on "Space Solutions for Global Problems: Building Working Partnerships with All Stakeholders in Human Security and Development"	Houston, United States of America (10-12 October 2002)	To review the follow-up actions of UNISPACE III to enhance human security and development through space applications, examine successful cases and develop a strategy to build partnership with civil society in making further progress
10	Third United Nations/ International Academy of Astronautics Workshop on Small Satellites at the Service of Developing Countries: beyond Technology Transfer	Houston, United States of America (12 October 2002)	To review the existing and proposed applications of small satellites, examine their operational aspects and assess the benefits for developing countries
11	United Nations/Economic and Social Commission for Asia and the Pacific/European Space Agency/Committee on Earth Observation Satellites Workshop on the Use of Space Technology in Disaster Management, for the benefit of Asia and the Pacific	Bangkok (November 2002)	To identify disasters of concern to Asia and the Pacific and to propose possible pilot projects to enhance disaster management with the use of space technology
12	United Nations/United States of America International Meeting of Experts on the Use of Global Navigation Satellite Systems	Vienna (November 2002)	To review the recommendations of the four regional workshops on global navigation satellite systems and to recommend possible follow-up action
13	United Nations/European Space Agency Workshop on Remote Sensing for Environmental Monitoring and Natural Resources Management	Prague (2002)	To improve decision-making in development activities while protecting the environment; for countries in eastern Europe

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Report on the United Nations/Austria/European Space Agency Symposium on Enhancing the Participation of Youth in Space Activities: Implementing the Recommendations of UNISPACE III

(Graz, Austria, 17-20 September 2001)*

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* The present report required preparation by the individual speakers of abstracts of the presentations that they had made during the workshop. This process took several weeks, which delayed the submission of the report.

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I. Introduction

A. Background and objectives

1. In its resolution 54/68 of 6 December 1999, the General Assembly endorsed the resolution entitled "The Space Millennium: Vienna Declaration on Space and Human Development"[1] which had been adopted by the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III). UNISPACE III had formulated the Vienna Declaration as the nucleus of a strategy to address global challenges in the future. Part of that strategy called for actions to create, within the framework of the Committee on the Peaceful Uses of Outer Space, a consultative mechanism to facilitate the continued participation of young people from all over the world in cooperative space-related activities.

2. In his report of 10 January 2000 to the Committee and its Scientific and Technical Subcommittee (A/AC.105/730), the Expert on Space Applications proposed the organization of a series of symposia to promote the participation of young people in space activities as part of the programme of workshops, training courses, symposia and conferences of the United Nations Programme on Space Applications for 2000-2002. In its report on its forty-third session, the Committee endorsed the organization of such a series of symposia.[2]

3. The present report contains a summary of the presentations and discussions of the second United Nations/Austria/European Space Agency Symposium on Enhancing the Participation of Youth in Space Activities, held from 17 to 20 September 2001 in Graz, Austria. The symposium, the eighth in a series of symposia held in Graz, was organized as part of the 2001 activities of the United Nations Programme on Space Applications and was co-sponsored by the Federal Ministry for Foreign Affairs of Austria, the State of Styria, the City of Graz, the Federal Ministry for Transport, Innovation and Technology of Austria and the European Space Agency (ESA).

4. The 2001 symposium was the second of a series of three consecutive annual symposia dealing with the participation of young people in space activities. It provided young people with a forum to express their unique and innovative ideas and visions for turning some of the recommendations of UNISPACE III into reality. At the same time, it provided opportunities for young people to discuss how education and training, in particular among youth, should be addressed. The third symposium, which will also be held in Graz, Austria, will build on the outcomes of the 2001 symposium.

5. The objectives of the symposium were: (a) to continue to enhance the participation of youth from all over the world in space activities; (b) to review the progress that had been made in implementing the projects and activities that were proposed at the symposium held in 2000; (c) to identify some recommendations contained in the Vienna Declaration[1] and the report of the Space Generation Forum[3] of UNISPACE III for implementation by youth groups.

6. The present report covers the background and objectives of the symposium, as well as the discussions held, actions taken and recommendations made by the participants. It has been prepared for submission to the Committee on the Peaceful Uses of Outer Space at its forty-fifth session and to its Scientific and Technical Subcommittee at its thirty-ninth session in 2002. The proceedings of the symposium, including the list of participants, will be prepared by the Office for Outer Space Affairs in due course.

B. Programme

7. At the opening of the symposium, statements were made by representatives of the United Nations, ESA and the host country. The keynote addresses were given by Piero Messina, ESA, and Kelly Snook, Co-facilitator of the Space Generation Advisory Council in Support of the United Nations Programme on Space Applications. The programme included sessions on education and outreach; projects and activities being carried out by the Space Generation Advisory Council (SGAC); regional youth initiatives; parallel working group sessions of the regional youth groups of SGAC; and astrobiology. Presentations by invited speakers and working group sessions were followed by panel discussions.

8. Presentations were made by representatives of ESA, the Communications Commission of Kenya, the Swedish Institute of Space Physics, Cosmos Education Inc. of the United States of America, the Goddard Space Flight Center of the National Aeronautics and

Space Administration of the United States, the United Nations Office for Outer Space Affairs and SGAC.

C. Attendance

9. The United Nations, on behalf of the co-sponsors, invited developing countries to nominate suitable candidates under the age of 35 for participation in the symposium. Selected participants were required to have a university degree or well-established working experience in a field related to the overall theme of the meeting. The selected participants should also be working in programmes, projects or institutions that conducted education or outreach activities or with space-related companies. Students without university degree or professional working experience were accepted if they were actively involved in space-related activities in their home countries or SGAC or if they had been actively involved in the work of the Space Generation Forum during UNISPACE III.

10. Funds allocated by the Government of Austria and ESA were used to cover the travel and living expenses of selected participants. In total, 76 space experts attended the symposium.

11. The symposium was attended by participants from the following 35 countries: Algeria, Argentina, Australia, Austria, Azerbaijan, Bangladesh, Brazil, Burundi, Canada, Croatia, Germany, Ghana, Greece, Italy, Kazakhstan, Kenya, Malaysia, the Netherlands, Pakistan, the Philippines, Poland, Romania, South Africa, Sri Lanka, Swaziland, Sweden, the Syrian Arab Republic, Thailand, Turkey, the United Kingdom of Great Britain and Northern Ireland, the United Republic of Tanzania, the United States, Uzbekistan, Venezuela and Viet Nam.

II. Summary of proceedings of the symposium and recommended activities

A. Observations, activities to date and accomplishments

12. The people who have made the greatest impact on the world, for better or worse, have not necessarily always been the most intelligent, best educated or wealthiest. They have been the people with the strongest and deepest convictions. The common quality that the participants of the symposium exhibited, besides being talented young people, was the conviction that the peaceful use of space could profoundly benefit their nations and the world.

13. Discussions at the symposium focused on the participation of youth in space activities, emphasizing the potential inherent in the energy of youth and their position as the next generation of leaders. It was emphasized that the youth of what is being called "the space generation" were an agent for change and that the results of the Space Generation Forum and the previous symposium held in Graz, Austria, in 2000, amply demonstrated that fact.

14. Participants were provided with a broad overview of the mechanisms, activities and programmes through which young people could both benefit from and contribute to space for the benefit of humanity. Such mechanisms included SGAC and its numerous activities.

15. Initiatives that focused on education and outreach were fundamental to programmes to promote the participation of youth in space activities. Education and outreach were the focus of sessions 1 and 2 and constant themes throughout the symposium. Education was discussed in its broadest sense. The topics covered in presentations and discussions ranged from increasing the profile of space in society to using its multidisciplinary nature as a context to teach traditional studies in an exciting and accessible way. Particular emphasis was placed on how developing countries could use education as a cornerstone in developing their space activities.

16. At the sessions on current projects of SGAC (session 3) and regional youth initiatives (session 4) participants were inspired by the success stories, lessons learned and descriptions of obstacles overcome in the pursuit of the wide range of activities presented. (The activities are summarized in chap. III, sect. B, below.) The participants realized that many international projects that had been initiated or promoted by SGAC had furthered the peaceful use of outer space. However, they also realized that many challenges remained.

17. The participants, some of whom had attended the Space Generation Forum at UNISPACE III and the

2000 symposium at Graz, Austria, participated in working groups by geographic regions in sessions 5 and 6. The participants analysed the recommendations contained in the Vienna Declaration and the report of the Space Generation Forum. The working groups identified issues that were important to their regions and proposed projects that would serve to implement some of the recommendations in 2002. Those projects, including some that had been initiated in 2000, were formally endorsed by SGAC. The regional projects were presented to the participants of the symposium at the closing session. (The projects and activities are described in chap. III, sect. D, below.)

18. Throughout the symposium, the participants bore in mind that countries were at different stages in the development of space activities. While some countries were in a position to explore the solar system, other countries concentrated on specific areas of space activities and some had not yet developed a significant level of activity in the field. Furthermore, for many developing countries one of the first priorities was to establish infrastructure for communications and information technology. In that context, education and awareness were equally important to all and could serve as a common focus of cooperative activities.

19. Two youth groups, the African Alliance for Space and the Space Association of Turkish States, were formally created and endorsed by SGAC and the United Nations Office for Outer Space Affairs during the symposium.

B. Recommended action

20. Several projects were proposed as a result of discussions in the working groups (see chap. III, sect. D, below). The symposium recommended that the regional groups should establish local working groups that would develop action plans for implementing the projects and report on their progress to the 2002 symposium. The symposium noted that, to be successful, the groups would need to find access to telecommunications and some amount of funding.

21. The participants requested SGAC to disseminate a list of its country and regional representatives and to provide more guidance and support to the regional groups. It was also agreed that letters identifying the regional representatives and their positions within SGAC were needed to facilitate outreach activities and other substantive work. The Office for Outer Space Affairs and SGAC agreed to provide such letters.

22. The participants also requested SGAC to continue to promote the participation of young people, particularly young women, in space activities and to seek to include the developing countries in SGAC activities on a priority basis.

III. Presentations and discussions

23. The overall theme of the symposium was introduced by the two keynote speakers. They represented the views of youth and educational institutions, placing the goals of the symposium in juxtaposition to the terrorist attacks in the United States. They focused on the ever-increasing inter-dependence of humanity and the vision that all people had Earth as a common homeland. Current and future leaders and decision makers were called upon to exercise a new model of leadership based on the principles of humility, integrity and devotion to the unity and betterment of all peoples, thus placing all activities within a global context and requiring that global interests be paramount.

A. Education and outreach (sessions 1 and 2)

24. The session on education and outreach provided an overview of ongoing efforts of individuals and organizations to achieve increased public awareness, specifically through educational systems as well as by means of extracurricular educational activities designed for young people.

25. Francis Wangusi (Kenya) provided insight into the difficulties that Africa faced and the role that space technologies and youth could play in redressing them. If Africa could integrate space-related technologies with indigenous technologies to find sustainable solutions, the use of space would be vitally important for Africa. The challenge of doing so could be met in many ways: by increasing access to various technologies; by increasing international interaction; by developing local and regional youth forums; and by strengthening local communication networks. In that context, education and outreach efforts were essential

components in improving Africa's capability to solve its problems.

26. The Expert on Space Applications presented the education and training activities carried out under the United Nations Programme on Space Applications. The efforts of the Programme were directed towards improving the capacity of developing countries to use space technology for development purposes. The Programme organized short-term training courses for technical personnel and workshops to raise the awareness of managers and decision makers of specific space technology applications. The Programme promoted long-term education through fellowships at space institutions and through the regional centres for space and technology education, affiliated to the United Nations. Such Centres had been operating successfully in India, Morocco and Nigeria. Similar centres were being established in Brazil, Jordan and Mexico. A network of space science and technology education and research institutions of central-eastern and south-eastern Europe had also been established under the aegis of the Programme.

27. Piero Messina, ESA, provided insight into many of the educational and outreach activities and opportunities that ESA provided for European young people. As a basic policy, ESA committed one per cent of its budget to education and outreach. That level of commitment translated into a large number of ESA-sponsored educational activities for young people, ranging from dedicated web pages and educational newsletters to opportunities to carry out experiments on parabolic flights. Through such programmes, ESA aimed to challenge and motivate gifted youth and in turn strengthen the space workforce in Europe. Most of the programmes were for Europeans only.

28. Nina von Krusenstierna (Sweden) provided insight into the aims and activities of the Kiruna Space Campus (KSC), a Swedish governmental research institute that carried out basic research on space physics. It was unique among institutions as it carried out advanced space research in a wilderness environment where the aurora borealis phenomenon could be seen during a large part of the year. The Campus was more than a standard research institute, as it had an active network of contacts with companies, educational outreach programmes, industry, local communities and the tourism industry. Because of the many activities at the Campus, students were given unique opportunities to engage in interactive collaboration with space professionals. Every student at KSC was involved in either a satellite or an atmospheric balloon project. The Campus had outreach activities that included organizing national student contests and preparing forecasts of aurora events.

B. The Space Generation Advisory Council and its projects (session 3)

29. The results of and progress achieved on some of the activities and projects of SGAC that were initiated as a result of the 2000 Symposium were presented to the symposium.

30. Incigul Polat (Turkey) made a presentation on the environmental degradation caused by deforestation in Burundi and the application of remote sensing to assist in dealing with the problem. An interregional project that had received strong support from the Government of Burundi, the Canadian Space Agency and local community groups not only provided environmental benefits but also served as a working example of the effective use of space technology in developing countries while providing inspiration and education to local youth. A key to the success of the project was the involvement of young people from several continents with local people at all levels. The project will continue in 2002.

31. George Whiteside (United States) provided information on "Yuri's Night", a world space outreach project and global celebration of humanity. The diversity of Yuri's night celebrations was matched only by the diversity of the participants and celebrations, which ranged from dance parties attended by 1,500 people to three-day space-related conferences. Yuri's Night was celebrated in 64 cities in 29 countries. It was estimated that 10,000 people had attended Yuri's Night activities and that, through extensive media coverage, the event had reached around 25 million people. Yuri's Night also raised $30,000 in funds to cover direct costs and support selected international charities.

32. Kevin Hand (United States) talked about activities of the Cosmos Education organization and the project entitled "Under African Skies". The project involved an international team of youth from 13 countries and 5 continents who travelled from

Johannesburg to Nairobi during a period of 40 days in the summer of 2001. The team visited five countries. It reached 34 schools, educating 4,000 students on a variety of space-related topics from astronomy to history and culture. The project was a powerful example of international cooperation that excited, engaged and empowered African youth. The highlight of the expedition was a three-day conference that coincided with a solar eclipse. The Office for Outer Space Affairs participated in the conference. The project will be organized again in 2002, and there are plans to extend it to Asia and eventually to the whole world.

33. Stuart Gill (Australia) made a presentation, which had been prepared jointly with James Moody (Australia), on the Australian Students' Space Association (ASSA) and Space Futures 2000 (SF2K) conference. Organized by ASSA, SF2K had been held during World Space Week and had attracted over 200 Australian university students and young professionals. The conference served as a forum for Australian youth to discover space activities in Australia and to provide networking opportunities and access to the international space community. The theme of the conference was "Education and collaboration—building a sustainable space industry". The major outcome of the conference was the Space Youth Charter, reflecting the visions of young people for Australian space activities. The Charter was presented to and received positively by the Australian Government. An Educator Forum, held in conjunction with the conference, helped to generate considerable activity in Australian space education and led to a grant of 6.4 million Australian dollars to build a space education centre in Victoria and the inclusion of a space curriculum in the Queensland educational initiative "New basics". A second Space Futures conference that will focus on innovation and development, will be organized in 2002. The conference will reach out to countries in the Asia and Pacific region.

34. Alenson de Bortoli (Brazil) made a presentation on the activity entitled "SPACE", describing activities carried out for the benefit of young people in Brazil. The concept of SPACE had been created at the Space Generation Forum during UNISPACE III in 1999. The aim of SPACE was to introduce talented students to space science and technology by providing challenging group projects. Special emphasis was placed on presenting the projects to the public. Projects that had been concluded included the building of experimental rockets and "UNOSAT I", a student-built satellite with community participation that would broadcast the first Brazilian voice from space. The projects were to be presented at the fifty-second Congress of the International Astronautical Federation, to be held in Toulouse, France, in October 2001.

35. Gernot Groemer (Austria) made a presentation, which had been prepared jointly with Mark Dejmek (Canada), on the SGAC project entitled "Global Space Education Curriculum". The aim of the project was to develop a global space curriculum for primary, secondary and tertiary schools. The curriculum would respond to the educational initiatives of the United Nations aimed at incorporating space science and technology into the educational systems of all countries. Another initiative of SGAC was an ambitious project entitled "Global Space Education Index", which would produce a consolidated directory of existing space education material in order to facilitate access to it. Several other international pilot projects were also discussed, including the organization of an event during World Space Week.

C. Regional youth initiatives (session 4)

36. Patricio Figueredo (Argentina), a founder of the Asociación Latinoamericana del Espacio (ALE) at the Graz symposium in 2000, provided an overview of the activities of ALE. The one-year-old ALE was a regional point of contact that provided opportunities for young people to increase their awareness of space in general through collaboration in joint projects, education and outreach. The projects and activities included the development of a web page project, experimental rocketry, demographic studies and automated hydroponics.

37. Will Marshall (United Kingdom) shared his experience in setting up a national youth advisory group that worked in cooperation with the British National Space Council. He suggested ways in which youth, from the bottom up, could influence and contribute to government policy. Participants in the symposium were encouraged to explore opportunities in their home countries, for example, establishing relationships that would increase the awareness of local decision makers and strengthen the efforts of

young people who were helping to implement the recommendations of UNISPACE III and the Space Generation Forum. A logical next step would be to act at the regional level, which in the case of Europe would mean approaching ESA.

38. During the discussion that followed, it was suggested that SGAC could collaborate with other youth advisory groups (e.g. the United Nations Environment Programme Youth Advisory Council) to build synergies in youth activity.

39. Asante Foster (Ghana) made a presentation on the African Youth in Space Initiative Programmes. The initiative had resulted from the success of UNISPACE III in inspiring the world, particularly Africa, to promote the use of space applications to create and promote space education that would support sustainable human development and increase the opportunities for space activities in Africa. Africa faced many difficulties. Foremost of those was the lack of public and government awareness of the potential of space technology for providing information for decision making. That lack of awareness was compounded by a lack of infrastructure, especially in information technology, to disseminate information. Such difficulties defined the goals of a group of African youth. To achieve those goals, there was need to develop cooperative relationships with the international space community. The group was committed to promoting such activities as World Space Week, Yuri's Night and various youth outreach projects that would generate enthusiasm and interest. Other specific actions included the development of a pilot regional youth conference and possible activities at the 2002 World Space Congress.

40. Imram Majid (Pakistan) made a presentation on the involvement of young people and space professionals in western Asia in a project called "Khalla". The aim of the project was to motivate regional planners and youth to work towards building a resourceful network of young visionaries. The problems to be solved using remote sensing technologies included deforestation and urban planning. Activities in those areas included promoting education for all and creating awareness. Another aim of the project was to disseminate information on the activities of the Islamic Youth Working Group, which promoted SGAC activities, Yuri's Night and the organization of the Pakistan World Space Week.

41. Elchin Babayev (Azerbaijan) provided information on the Azerbaijan National Aero-Space Agency (ANASA), which included five scientific and technological enterprises plus a number of astronomical observatories and other space-related organizations. Some 14 young people were actively involved in the local branch of SGAC, and the aim of their group was to realize the existing potential of young people by providing them with space goals to be implemented in the near future. The achievements of the group included receiving extensive press coverage and providing access to jobs for talented young people. Future steps included establishing contacts with various international space agencies.

42. A presentation by four participants focused on Cassiopee, one of the two design projects of the summer session of 2001 of the International Space University. The project was developed as an environmental satellite focused on Europe for verifying compliance with the Kyoto Protocol, and in particular monitoring greenhouse gases, which affected global climate change. The satellite was scheduled for launch in 2005 and would monitor the entire European continent. The satellite mission was expected to increase knowledge about biogenic emissions, refine the technology and monitor compliance with the Kyoto Protocol.

D. Regional youth working groups (sessions 5 and 6)

43. The third day of the symposium was devoted to meetings of regional groups. During those meetings, the groups formulated proposals for practical initiatives to implement the recommendations of UNISPACE III and the Space Generation Forum, as well as other activities. As indicated in paragraph 20, above, the plans of action for each proposal were to be developed by the regional groups after the conclusion of the symposium. The project titles and mission statements of each of the regional groups are presented below.

Latin America

44. The projects of the regional group for Latin America are:

(a) *Asociación Latinoamericana del Espacio (ALE)*: to develop a strategy to further the growth of ALE and, by doing so, to fulfil one of the recommendations of the Space Generation Forum on a vision of the future (A/CONF.184/L.14);

(b) *ALE web site*: to expand the ALE web site to serve as an information resource, provide a point of contact and facilitate communication among Latin Americans;

(c) *Latin American space school*: to create a programme that educates teachers and students in space science and technology and their peaceful applications. To disseminate information, prepare educators and provide educational opportunities for Latin Americans.

Asia and the Pacific and western Asia

45. The projects of the regional group for Asia and the Pacific and western Asia are:

(a) *Regional education fund*: to establish a fund that will support space prizes and the promotion of space education programmes at the regional and global levels. The fund will also provide for a proposed regional space school;

(b) *Space philosophy booklet*: to prepare a multilingual booklet to consolidate the vision of youth, raise the awareness of national Governments and the general public and promote cultural ties. The work will be overseen by an intergenerational moral and ethics committee;

(c) *Regional youth conference*: to organize a conference with the objectives of supporting and coordinating activities of youth working groups through SGAC influencing policy-making bodies and the public in order to generate support for space science and technology. The Office for Outer Space Affairs will be invited to participate in the conference;

(d) *Regional space agency*: to carry out a study on the feasibility of enhancing cooperation between countries to cater to regional needs and to improve access to space information in order to bridge the information gap;

(e) *Disaster management*: to promote the use of space technology to mitigate the effects of natural disasters and facilitate disaster management;

(f) *Space debris*: to establish a committee on space ecology to increase public awareness of space hazards;

(g) *Space information technology*: to develop databases and web sites to increase regional access to information.

Africa

46. The projects of the regional group for Africa are:

(a) *African youth conference on space science and space applications*: to hold a regional space conference to promote space awareness among African youth. The conference will explore ways to integrate space technology into sustainable development programmes and education curricula in Africa;

(b) *Burundi deforestation project*: to preserve natural resources using space technology; to increase awareness of the appropriate use of space technology (remote sensing) and its role in sustainable development for Africa; to establish local non-governmental youth groups to sustain the initiative; and to ensure that communities are involved in maintaining their local environmental resources through decision-making and, hence, improving quality of life;

(c) *World Space Congress*: to use the World Space Congress to promote the visibility of space education in Africa; to establish a network of international contacts by attending the World Space Congress; and to ensure the establishment of space desks in all governmental and non-governmental institutions in Africa as a way of enhancing the implementation and sustainability of projects.

Europe

47. The projects of the regional group for Europe are:

(a) *Integrate European activities*: to encourage the establishment of national space agencies in every European country and to integrate their activities under a pan-European body;

(b) *Global space prize*: to create a high-profile annual global space prize (similar to the Nobel prize) to promote space achievements;

(c) *Space education curriculum*: to assess the content of space topics in existing curricula in European countries with the goal of furthering the level

of space education. Initially a pilot project involving six countries will be conducted;

(d) *Fundraising*: to raise funds to develop youth awareness of the space sciences and to recommend a form of funding for projects and organizations associated with SGAC. Projects that can make profit (e.g. Yuri's Night) would be used to raise funds for other current and future projects of SGAC (e.g. Under African Skies);

(e) *Science teacher exchange programme*: to exchange teachers and experience between Europe and Africa. While there is a surplus of teachers in some science disciplines in certain African countries, there is a need for teachers in Europe.

North America

48. The projects of the regional group for North America are:

(a) *World Space Congress*: to organize a youth space conference for young people in conjunction with the World Space Conference 2002, which will be held in Houston, Texas, United States, and to encourage broad participation and emphasize the participation of developing nations;

(b) *SGAC development in North America*: to continue the growth and development of SGAC in North America; to continue to support ongoing activities and initiatives as well as develop new ones; and to expand the capabilities of the North American region and develop better communication methods. This will enhance cooperation within the region and globally.

Global working group

49. The global working group recommended that SGAC, along with other organizations, should propose the idea of creating a United Nations committee for the long-term survival and prosperity of humanity to potential sponsor countries that could bring the idea to either the General Assembly of the United Nations or to the United Nations Educational, Scientific and Cultural Organization.

E. Astrobiology (session 7)

50. "Astrobiology is the study of the origin, distribution and future of life in the Universe". With that broad and visionary definition, Mark Lupisella presented astrobiology as relating to the aims and the objectives of SGAC. He emphasized that its multi-disciplinary nature and its broad interest for society led naturally to applications in innovative education and public outreach and to discussion of such issues as planetary stewardship and planetary protection, ethical and theological matters, the impact of proof of alien life on humanity and cross-contamination between celestial bodies.

51. During the discussion, various related topics were mentioned, including ESA activities in astrobiology, the young astrobiology network in the United Kingdom, risks of contamination caused by human missions to Mars and the agendas of future meetings of the Astrobiology Society.

Notes

[1] See *Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 19-30 July 1999* (United Nations publication, Sales No. E.00.I.3), chap. I, resolution 1.

[2] *Official Records of the General Assembly, Fifty-fifth Session, Supplement No. 20* (A/55/20).

[3] See *Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space ...*, annex II.

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Report on the United Nations/International Astronautical Federation Workshop on Making Space Applications Operational: Opportunities and Challenges for Sustainable Development

(Albi, France, 27-29 September 2001)*

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* The present report required preparation by the individual speakers of abstracts of the presentations that they had made during the workshop. This process took several weeks, which delayed the submission of the report.

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I. Introduction

A. Background and objectives

1. The Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III), and the Vienna Declaration on Space and Human Development that emanated from it, recommended that activities of the United Nations Programme on Space Applications promote collaborative participation among Member States at both the regional and international levels, emphasizing the development of knowledge and skills in developing countries.[1] At its forty-third session, in 2000, the Committee on the Peaceful Uses of Outer Space endorsed the programme of workshops, training courses, symposia and conferences planned for 2001 under the United Nations Programme on Space Applications.[2] Subsequently, the General Assembly, in its resolution 55/122 of 8 December 2000, endorsed the activities of the Programme for 2001.

2. The present report contains a summary of the presentations and discussions of the United Nations/International Astronautical Federation Workshop on Making Space Applications Operational: Opportunities and Challenges for Sustainable Development. Organized by the Office for Outer Space Affairs as part of the 2001 activities of the United Nations Programme on Space Applications, the workshop was co-sponsored by the International Astronautical Federation (IAF), the European Space Agency (ESA) and the Government of France. It was the eleventh workshop of this series and was held in Albi, France, in conjunction with the fifty-second Congress of the IAF, held in Toulouse. Organizational, financial and programme support was provided locally by the Centre national d'études spatiales (CNES) of France.

3. Noting that the Committee had agreed that one of the single issues/items for discussion on the draft provisional agenda for the thirty-ninth session of the Scientific and Technical Subcommittee would be the mobilization of financial resources to develop capacity in space science and technology applications,[3] the co-sponsors agreed to focus the presentations and discussions of the workshop on that topic. Thus, the report of the workshop could provide background material on funding issues for consideration by the Subcommittee.

4. Applications of space technology play an increasing role in national development. However, the potential of space applications, particularly for developing countries, in such fields as remote sensing, telecommunications and satellite navigation and positioning systems, while enormous, remains largely unrealized. The ability to use space applications for development depends critically on the availability of personnel with appropriate knowledge and skills; on the possibility for them to gain experience; on establishing long-term policies; on setting up institutional frameworks and physical infrastructures; and on ensuring support for the operational use of the technology.

5. As is the case for any project, appropriate funding is crucial for the success of development initiatives using space technology. The lack of funding from both national and international sources is often the major obstacle in introducing space technology into operational development programmes or projects. That obstacle is linked to a low level of awareness of the possibilities and requirements for ensuring adequate financial resources to support priority programmes and to an inability to prove the cost-benefit advantage of space technology applications to decision makers and users.

6. The main objectives of the workshop were to assist participants in identifying: (a) the elements that would make project proposals acceptable to decision makers such that their results could serve as a basis for establishing operational Earth observation or other space applications; and (b) the conditions that would lead to the formulation of project proposals that were attractive to funding institutions or donor agencies.

7. The present report covers the background and objectives of the workshop as well as the presentations, discussions, observations and conclusions of the participants. It has been prepared for submission to the Committee on the Peaceful Uses of Outer Space at its forty-fifth session and to its Scientific and Technical Subcommittee at its thirty-ninth session in 2002. The participants will report to the appropriate authorities in their own countries. The proceedings of the workshop, together with a list of participants, will be made available in due course through the Office for Outer Space Affairs.

B. Programme

8. The workshop addressed the questions of how space applications could be made operational in programmes or

projects that were essential for sustainable development and of securing the necessary financing. That was achieved by considering different aspects of three successful case studies from different regions: Asia and the Pacific; Latin America and the Caribbean; and Africa. One of the case studies was a single project (project I) while the other two case studies (projects II and III) provided examples of frameworks for carrying out multiple projects. Although concentrating on the elements necessary to prepare a successful project/programme proposal, the presentations included the obstacles that had been encountered in obtaining funding for projects and how those obstacles had been overcome.

9. The participants were shown examples of how to formulate attractive project proposals that described the needs to be addressed and the solutions to be provided in a clear and comprehensive manner, specifically demonstrating the integration and cost-benefit advantage of Earth observation applications in such project proposals.

10. A separate session addressed funding and financing strategies. Representatives of national and international funding organizations were invited to explain the application procedures and project requirements of their respective organizations, and the presentations were complemented by panel discussions. Thus, participants were given the opportunity to identify positive elements to include, as well as pitfalls that should be avoided, when drafting submissions to national and international institutions and donor organizations.

11. In addition, 14 participants, mainly from developing countries, made short presentations and provided an insight into the status of space technology applications in their respective countries.

12. Presentations were made by the Indian Space Research Organization (ISRO), the University of São Paolo (Brazil), the Canadian International Development Agency (CIDA), the African Development Bank (ADB), the United National Office for Outer Space Affairs, the Association pour le Développement de l'Information Environnementale (ADIE), the École Nationale du Génie Rural des Eaux et des Forêts (Engref, France), the Inter-American Development Bank (IADB), the Instituto Nacional de Pesquisas Espaciais (INPE) of Brazil, the Dirección General de Aviación Civil of Chile, the Instituto de Geofísica y Astronomía of Cuba, the Universidad do Norte do Paraná of Brazil, ESA, Tübitak of Turkey, the University of Rajasthan (India), the National Institute of Aeronautics and Space (LAPAN) of Indonesia, the Université Mohammed V. (Morocco), the Bangladesh Space Research and Remote Sensing Organization (SPARSSO), Surrey Satellite Technology Ltd. (United Kingdom of Great Britain and Northern Ireland), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the Uzbekistan State Space Agency, the South African Astronomical Observatory and the Centre National des Techniques Spatiales of Algeria.

C. Attendance

13. The United Nations, on behalf of the co-sponsors, invited developing countries to nominate candidates for participation in the workshop. Selected participants were required to have a university degree or well-established professional working experience in a field related to the overall theme of the workshop. In addition, participants were selected on the basis of their working experience in programmes, projects or enterprises that were already using space technology applications or that could potentially benefit from using space technology.

14. Funds contributed by the Government of France, the United Nations, ESA and IAF for the organization of the workshop were used to cover the international air travel and per diem expenses of 21 speakers and participants from developing countries. The co-sponsors also covered the cost of registration fees and living expenses for participants from developing countries to participate in the 52nd International Astronautical Congress, which was held immediately after the UN/IAF workshop.

15. The workshop was attended by 62 participants from the following 30 countries: Algeria, Angola, Austria, Bangladesh, Brazil, Canada, Chile, Cuba, France, Gabon, Germany, India, Indonesia, Israel, Italy, Japan, Jordan, Morocco, the Netherlands, Romania, South Africa, Spain, the Syrian Arab Republic, Tunisia, Turkey, Ukraine, the United Kingdom, the United States of America, Uzbekistan and Yugoslavia.

II. Observations and conclusions

16. The participants examined which needs should be met by project proposals, who should act as partners in the implementing team, what synergies should be sought and how to overcome obstacles in projects.

17. The participants found that the main obstacles to making greater operational use of space applications in sustainable development projects or programmes could be classified under the following three broad categories:

(a) Lack of or insufficient awareness on the part of decision makers and programme managers of the usefulness of space technologies to support development projects or programmes;

(b) Lack of or insufficient funding dedicated to the use of space technologies in a project or programme, which translated into insufficient hardware, software, literature and satellite data;

(c) Lack of or insufficient local capacity to use space-related technologies.

18. Through discussions held during the question-and-answer periods after each of the presentations and during the panel and round table, the participants made the observations and drew the conclusions that follow. Although the observations and conclusions focused on remote sensing applications, analogies could be drawn for other space applications.

Raising the awareness of decision makers

19. The main priorities of the governmental and non-governmental institutions of a country are to provide solutions to basic needs (e.g. food, clean water, shelter, disaster reduction, health and education services, energy and communications) of its population and in general to promote a better quality of life for all. At the international level, Governments try to meet obligations, such as those in respect of climate change as set out in the Kyoto Protocol.

20. Attempts leading to the use of Earth observation data on an operational basis should be put into the context of meeting national needs. That is, remote sensing and other space technologies should be integrated into management and policy-making as a tool to support development priorities.

21. The process of convincing decision makers of the usefulness of remote sensing from space is lengthy and requires continuous dialogue. Drawing from the lessons learned by individuals and institutions that implemented the projects that were presented to the workshop, the participants concluded that it takes four to five years to convince decision makers and other stakeholders of the usefulness of remote sensing.

22. Those who can provide the application capabilities can begin by proposing to decision makers in potential user institutions that remote sensing could be used to provide solutions for clearly identified needs. In doing so, it is essential to understand the needs for information that those decision makers have and the form in which that information should be presented for it to be useful in their work. Proposals should be participatory in nature, involving all the stakeholders.

23. A way of bringing together all the stakeholders is through a pilot or demonstration project. The results of such a project are more likely to be accepted if a "bottom-up" approach is followed, in some cases reaching down to the grass-roots level. The involvement of non-governmental organizations helps in interfacing with that level. Owing to the diverse backgrounds of those involved in the project, a training component will be necessary to develop a common understanding of the terminology to be used.

24. It would be important to identify within the user institutions individuals who could act as "champions" for projects. These would be individuals who strongly support the use of new technologies to achieve the development objectives of the project proposal.

25. The information provided by a project should be in a language to which the end users are accustomed. An important product would be a concise report that enables decision makers to compare the results achieved using remote sensing with those achieved using conventional tools in terms of costs, time and quality. It would also be important to highlight the "products" of the project, for example, long-lasting tools such as a digital database for future decision-making, as well as the capacity that has been built up.

Ensuring funding support on a sustainable basis

26. Once the use of a space application has been integrated into the broader context of national or regional development priorities, funding needs to be secured. There are various national and international sources and mechanisms for funding projects or programmes, and the choice of which of these should be approached would depend on the priority area to be addressed and whether the project is meant to be a demonstration or operational.

27. The three case studies that were presented at the workshop were examples of successful projects or sources of projects that addressed either local or national

needs and had received the necessary funding support. All three had been built upon the resources (in cash and in kind) of the institutions carrying them out. However, each of them used a different funding source or mechanism to supplement the balance of resources needed.

28. In addition to the budgets and resources of the partners of a project proposal, other funding sources include the ministries that would be the end users, national institutions funding research and development, bilateral development aid institutions, regional and international development institutions, dedicated international development funds (e.g. the Global Environmental Facility or the United Nations Foundation) and the private sector as well as funding mechanisms such as using a part of an ad hoc state tax or the revenue derived from the results of the project. In the case of the private sector, a company may be willing to provide some of the financing for a project if it is given the right to commercialize the methodology developed by the project.

29. Those preparing project or programme proposals to be submitted for funding should ensure that the proposals will be attractive to potential donor or funding institutions (hereafter referred to as "funding institutions"). Making a proposal attractive requires extensive background work. Some guidelines to consider are presented below.

30. Projects or programmes that address national priorities generally have budgets for carrying out the work involved in meeting their objectives. In cases where those budgets are insufficient, it is expected that whatever international or private sector funding might be secured would be targeted primarily for those priority areas. Thus, a premise upon which project proposals should be built is that the use of space technology can improve the cost-benefit ratio that can be expected for the limited financial resources available.

31. The proposal should be made by a balanced team that includes members with all the skills required. Demonstration projects and, in particular, operational projects or programmes need to have strong support from each participating institution. At least one of the institutions should have well-established capabilities in the specific space application, for instance remote sensing. Where this is not the case, technical advice should be sought through international cooperation. The whole team should be exposed to the technology underpinning the project. Interdisciplinary rivalries among participating institutions should be resolved, and the roles of each partner should be clear.

32. Government support is a must for projects or programmes of national scope and for projects for which international funding will be sought. There should be a firm funding commitment (in cash and in kind) to a pilot or demonstration project proposal by the institutions that participate in it, as this will add credibility to the proposal. The user institutions should clearly indicate their commitment to using the space application upon demonstration of its cost effectiveness.

33. It is necessary to know the funding institutions and their procedures. The proposal should target donor priorities. Key individuals in the funding institutions should be identified. It is very useful to find a "champion" in the funding institution to support the project through the various stages of the funding procedure.

34. The proposal should include an indication of the conditions for and methods of sustaining the space application on an operational basis after the demonstration phase. Funding institutions consider it important to be assured that the results of financed projects will continue to be used once the external funding ceases.

35. Overall, a proposal submitted for funding should be based on complete documentation. The submitting entity should be prepared to answer all questions and concerns of the potential funding institution.

Building local capacity to use space-related technologies

36. There is a pressing need to provide developing countries with further education and training opportunities in all areas of space science and technology. Education and training is essential if space technologies are to be integrated into operational programmes. In particular, there is a need to build capacity for greater operational use of Earth observation data. The demand is for information derived from space data rather than for raw remote sensing data. Thus, there is a need for training to develop capacity in "integrated approaches", i.e. using other technologies such as geographic information systems (GIS) and global navigation satellites.

37. As the subject on education and training had been dealt with in many other forums, the participants did not elaborate on this subject during their discussions.

III. Summary of presentations

38. The workshop was opened with welcome statements by representatives of CNES, the City of Albi, IAF, ESA and the United Nations Office for Outer Space Affairs.

39. In his address entitled "Space and Sustainable Development", U. R. Rao, Chairman of the IAF Committee for Liaison with International Organizations and Developing Nations (CLIODN) used several examples to highlight the value of using space technology to support sustainable development and introduced the objectives of the workshop. In the ensuing discussion, it became clear that the use of space applications should be integrated into the broader context of national or regional development priorities and that emphasis should be placed on understanding the needs and possible contributions of the end users.

A. Conservation of water resources and forest cover (project I)

40. Carlos A. Vettorazzi presented a case study on a project carried out in Brazil for the conservation of water resources and forest cover in the Corumbatai river basin (an area of 1,760 km^2) to ensure the supply of drinking water for the City of Piracicaba (350,000 inhabitants) in the State of São Paulo. The project also aimed at addressing the high level of pollution of the Piracicaba River, which was due mainly to agriculture and cattle raising activities carried out in areas originally covered by dense native forests. Thus, one of the main objectives of the project was to map priority areas for reforestation with appropriate plant species. The use of satellite images, global navigation positioning from satellites and GIS became some of the tools selected to reach that objective.

41. The project was an excellent example of a national institution with space-applications capabilities, namely the Forest Research Institute of the University of São Paulo, working with all relevant local user authorities, i.e. the Water Department of Piracicaba, the Municipal Office of Environment and Planning of Piracicaba, an inter-municipal consortium for the Piracicaba, Jundai and Capivari river basin authorities, and the Forest Institute of the State of São Paulo.

42. Each participating entity provided the financial and infrastructural support needed to carry out most of its share in the project. Additional funding for the project was obtained from part of a tax of 0.01 reais that was collected by the inter-municipal consortium of river basin authorities for each cubic metre of drinking water that was delivered by the project. The other part of the tax was dedicated to clean-up operations.

43. The project required around four years to bring all relevant actors together and to resolve conflicts of interests, particularly between agricultural and cattle-raising activities and the need for an abundant and clean water supply for the City of Piracicaba and its environs. Those conflicts were resolved primarily on the basis of an existing law for the regeneration of the environment.

44. The project also had to overcome difficulties in communication between the various partners (e.g. agronomers, foresters, civil engineers, hydrologists and administrators). Another obstacle was the non-existence of a regional database and other basic infrastructure.

45. As a result of the project, a digital database of the Piracicaba river basin was currently available to decision makers and scientists, the reforestation of the basin was under way and an education process for planners, other users and the general public had begun. New infra-structure had emerged as a concrete result of the project as well as increased user awareness of the solutions that space technology had to offer. The successful results obtained by the project had led to invitations to apply the same methodology in other river basins.

B. Remote sensing applications for sustainable development: lessons learned from the Indian experience (project II)

46. Mukundo Rao, ISRO, presented the Remote Sensing in Support of National Development Programme of India and the lessons learned during its implementation. India is one of a handful of spacefaring nations that had end-to-end capabilities in space science and technology. Those capabilities covered the development of launchers, building of satellites and having programmes in all fields of space technology applications, including natural resources sustainability, environmental integrity and disaster support programmes.

47. Over many years, India's policy on the development of space technology had been that its applications had to meet national needs. Following that policy, India had established the National Natural Remote Monitoring System (NNRMS) as part of its space technology applications programme. NNRMS is based on the following cornerstones:

(a) Remote sensing satellite missions are defined and implemented on the basis of national needs;

(b) Based on a staged approach, appropriate application programmes are developed;

(c) The technology applications programme begin with demonstration projects that are followed by national projects and finally the technology is integrated into national/state programmes;

(d) A user network, integrating the end-user organizations in all of the programme's phases is created;

(e) Training and research activities are an integral part of each programme;

(f) Implementation of the programme is done by local agencies (i.e. delivery to grass-roots level);

(g) Application projects are directly funded by the appropriate ministries;

(h) The commercial sector is integrated.

48. Throughout the country, 23 remote sensing centres generate information that is provided to state and district agencies for use in project implementation. Some of the operational application programmes that had been developed in the framework of NNRMS were in the following areas:

(a) *Agrometeorology and land-based observations*. From a prototype project, the application evolved into a national programme with the establishment of an operational national centre for crop forecasting. The centre generates four crop estimates prior to harvesting;

(b) *Management of drinking water resources*. The programme provides information for the provision of drinking water to 600,000 villages. The programme started as a demonstration project on the methodology for using remote sensing data for water management purposes and evolved into a national project for finding sources of water. It was subsequently turned into a national/statewide water management programme;

(c) *Integrated Mission for Sustainable Development (IMSD)*. IMSD evolved from a demonstration project on the methodology for using remote sensing data to support sustainable development, involving 12 districts in 1992-1993, into a national project, involving 171 districts in 1994-1998) and, since 1999, into a national/statewide programme for sustainable development. IMSD integrates ground, remote sensing and ancillary data. The information derived is used to support specific local action plans, e.g. surface-water exploitation, groundwater exploration and recharge, soil conservation, and alternative land use;

(d) *Other areas*. Other operational applications include the mapping of salt-affected soils and water-logged areas, wasteland mapping and developing strategies for urban development (applied in almost every major city in the country);

(e) *Disaster management*. Currently, work is ongoing at ISRO and NNRMS in the application area of disaster management. The work to date involves pilot projects in pre-disaster and post-disaster activities. Work is also going on in determining Chlorophyll-a distribution in the ocean for fishing purposes.

49. For the future, the following NNRMS applications are being considered:

(a) Conducting a natural resources inventory at a national scale;

(b) Producing small-scale cartographic maps of the country;

(c) Maximizing the dissemination of information on natural resources;

(d) Improving ocean state and weather forecasting;

(e) Improving support of the disaster management system;

(f) Developing a better scientific understanding of the Earth system and its processes;

(g) Establishing an information service for public use based on Earth observation applications;

(h) Assisting in the creation of a viable commercial remote sensing industry.

50. It was stressed that the Indian example was not the only way to plan for using space-gathered information. India was autonomous in space activities, which was not

the case for many other countries that could benefit from space technology applications. It was also mentioned that it was necessary to customize solutions to the needs of specific countries and users. For example, while some countries could benefit from launching a national small remote sensing satellite, other countries might find it more cost-efficient to purchase the data.

C. Association pour le Développement de l'Information Environnementale (project III)

51. Jean-Roger Mamiah, ADIE, made a presentation entitled "ADIE: Presentation and its Realizations in the Earth Observation Domain". ADIE had been created by a ministerial convention and was a body for regional coordination of national researchers, non-governmental organizations and the public sector. ADIE made available technical assistance to national institutions through national experts and international partners.

52. The main purpose of ADIE was to make information available to decision makers and had organized many workshops to train people locally on mapping technologies. To that end, it entered into contracts with organizations to provide them with satellite imagery and training. ADIE focused on the implementation of projects by getting the potential users involved in the project. All project funding was in the form of grants. ADIE worked through international cooperation and welcomed the prospect of enhancing it.

53. In many countries of central Africa, there was an insufficient number of local experts, limited baseline environmental information and underutilization of existing environmental information for decision-making. Those factors were significant obstacles for the use of information derived from space images. That meant that an extensive effort needed to be made to provide education and training, at all levels, in order for Earth observation data to be used operationally in sustainable development projects or programmes.

54. Gilles Lechapt, of École Nationale du Génie Rural des Eaux et des Forêts in Engref, France, made a presentation entitled "ADIE: Giving Priority to Users". As implied in its name, ADIE promoted development through international cooperation in the use of information for decision-making, particularly related to environmental matters.

55. Under the ADIE concept, "operational" meant that a project could be carried out with available and affordable resources. Thus, to the extent possible, ADIE used local skills to lower costs. At the same time, ADIE aimed to initiate service activities and to demonstrate their usefulness and their cost effectiveness.

56. ADIE supported project initiatives based on the identification of pressing user needs and placed great importance on the sustainability of its projects. In support of that policy, ADIE initiated service activities in the field of analysis of needs. Donors did not pay for data, but rather paid for the funding of local initiatives.

57. The experience of ADIE showed that to build a self-supporting institution it was necessary to obtain political support and recruit local experts, limiting the use of international experts. At the same time, it was important that there be local commitment to pay for infrastructure and that the cost was not passed on to the donors. Sustainability of projects also required that a well-trained community be built up. That included local training at a high level of expertise and north-south as well as south-south partnerships.

58. In the ensuing discussion, it was stressed that it was important to ensure the projects were sustainable and would not collapse once the initial seed funding had dried up. It was also mentioned that once the usefulness of remote sensing data was recognized, the user was usually willing to pay for it.

D. Funding and financing strategies

59. Presentations by representatives of CIDA, ADB, IADB and the Office for Outer Space Affairs described funding and financing strategies for development projects that integrated space technology applications.

60. First and foremost, the great majority of funding institutions funded development projects, not space projects. That meant that even a significant space component to a project had to be presented in the overall context as tool to the success of a sustainable development project. There were, however, institutions that funded scientific and technological research and development.

61. The representatives of funding institutions placed particular emphasis on the need for proponents of the use of space technology in development projects to

understand the mandates of funding institutions and the specific criteria established for specific funding programmes. Often, projects were not even considered for funding because they did not meet the formal criteria required of proposals. When the formal criteria were met, proposals were always evaluated against rating criteria, and a proposal was awarded points on the basis of how well its elements met each of the criteria. It was therefore essential for the initiators of a project to find out what those rating criteria for projects were.

62. In addition to developing a good understanding of the priorities of funding institutions, it would be important to identify within the institutions individuals who could act as "champions" for projects. Nevertheless, successful proposals had to demonstrate that the cost of offering a space-based solution was warranted by the greater benefit in development terms derived from it.

63. CIDA was the Canadian government organization charged with planning and executing approximately 80 per cent of the country's international development programme. With a budget of around $2.4 billion Canadian dollars, CIDA funded projects that supported sustainable development in more than 100 developing countries. A special extra fund of Can$ 100 million, to be spent within a five-year period, had been established to address climate change issues.

64. CIDA project activities took place within the context of established development policies, a management framework and a programme planning process. Those elements formed the broad environment in which projects were identified, appraised, designed, implemented and evaluated. The overall framework for Canadian development assistance concentrated on: (a) meeting basic human needs; (b) promoting the participation of women in development and gender equity; (c) infrastructure services; (d) human rights, democracy and good governance; (e) development of the private sector; and (f) the environment. Additional information on CIDA priorities and funding procedures may be obtained on its web site: www.acdi-cida.gc.ca.

65. The presentation by CIDA included the following basic principles to improve chances of getting funding for a proposal: (a) determine whether there is a market within CIDA for the proposal; (b) obtain an up-to-date copy of the instructions and other relevant information; (c) complete all parts of an application and submit it on time; (d) ensure that the proposal meets every evaluation criterion; (e) cultivate key contacts in CIDA and keep in touch regularly; and (f) be persistent.

66. ADB was a multilateral funding institution constituted by 77 member States (53 African countries and 24 donor countries). The main objective of the Bank was to assist its member States in reducing poverty by financing activities that supported, among others, good governance, agriculture, education and the development of the private sector.

67. Funding was provided to African member countries of the Bank on the basis of a classification (rich, intermediate and poor). Depending on that classification, member countries might be able to obtain loans from the Bank only, from the Nigeria Special Fund (medium rates) or from the Bank and the African Development Fund (soft loans). There were also funds that were disbursed as grants to finance technical assistance projects that were supervised by Bank specialists.

68. IADB sought to contribute to the efforts of its member States to attain a sustainable use of their environment and natural resources endowment by providing the technical and financial instruments necessary to achieve such a goal. For that purpose, IADB offers several financing mechanisms.

69. IADB determined the eligibility for funding on the basis of the priority awarded to projects by the requesting Governments, the eligibility of the proposed executing institution(s), the technical feasibility of the projects and the logical framework of the proposals. A critical condition for the selection of submitted project proposals was a proven demand for the proposed project activities and expected results.

70. Regarding the use of information and communication technology (ICT) for development by its member States, the objectives of IADB were to: (a) provide strategic and technical advice to Governments for the establishment and use of ICT; (b) carry out strategic analyses of needs, priorities and opportunities; (c) develop cooperation and co-financing agreements; (d) provide technical backstopping to projects; (e) promote linkages with and disseminate information to the public, private and civil society sectors; and (f) provide training in ICT. Recently, the IADB had established a programme to fund information and communication technology for social purposes (the "Tech Fund"). One of the programme's objectives was to ensure that the deployment of advanced geospatial technologies was

integrated with information and communication technologies.

71. The Office for Outer Space Affairs had acquired a degree of experience in seeking funding for projects. Some of that experience showed that space technologists and institutions preparing proposals often did not know where to begin the search for funding. To overcome that obstacle, it was highly desirable to establish a comprehensive database of potential funding institutions and their areas of interest. Establishing such a database made it possible to seek funding from a wide variety of sources and/or to tailor a project to a specific and relevant funding niche.

E. Panel and round table discussion on funding and financing strategies

72. A panel discussion on the last day of the workshop arrived at the conclusions presented below. Panel participants were Robert Missotten, UNESCO; Jean Sabourin, CIDA; a representative of the Office of Outer Space Affairs; and Jean-Pierre Rigoulot, ADB. Danilo Piaggesi, IADB, contributed to the discussions through a videoconference from the Bank's headquarters.

73. User-driven, application-oriented pilot projects were a good way to demonstrate that space technology could be a useful, practical, operational and cost-effective alternative to the use of traditional tools in providing solutions to specific development problems. Cost-benefit assessments, such as in using space imagery compared to aerial imagery, were essential.

74. A "best-practice" handbook for development projects using space assets would be useful. Space technologists often did not have significant experience in seeking funding for development-oriented projects. The approaches and strategies for drafting successful proposals to development funding institutions were quite different from those used for research and development or science and technology funding agencies. A best-practice handbook could be a useful tool for helping project proponents start the search for funds.

75. The space community had to reach out to sensitize the funding community to the relevance of space technology for development applications. One new method for accomplishing that would be for the space community to organize seminars at the venue of the donor agencies.

76. Jean-Pierre Rigoulot, ADB, stressed that the Bank was, in principle, ready to support any project contributing to reducing poverty in a country. However, of the US$ 36 billion that were available, only US$ 20 billion had been disbursed because countries did not meet the requirements.

77. Often, a Government decided what was best for the population, which was a top-down approach. However, when the beneficiaries were not integrated into the project, the efforts sometimes collapsed when the donor withdrew at the end of the project. Therefore, for the project to be considered sustainable, many donors insisted on a participatory approach that included the beneficiaries.

78. Jean Sabourin, CIDA, mentioned that, in some cases, consultants involved in developing projects actually had little experience in working with developing countries. For CIDA, a participatory approach was therefore mandatory. CIDA used an iterative approach to its projects, which started with a small pilot project; only after successful completion of the initial project did the effort evolve into a fully-fledged project.

79. A representative of the Office for Outer Space Affairs indicated that the process of obtaining funding for development projects could also act as a reality check for the project. That meant that, if attracting development funding for a project was difficult, perhaps the application or the approach in presenting the application was not the best possible. It was necessary to develop the skills and tools to attract funding for projects. For that purpose, a database of successful project case studies as well as a database of funding and donor institutions would be very useful.

F. Presentations by participants

80. The workshop provided opportunities for participants to describe their national activities, including elements that had made those activities successful or were obstacles. The presentations are summarized below.

81. Amarendra K. Sinha of the University of Rajasthan (India) presented sustainable development projects that addressed the problem of water security. In India, many regions might experience water scarcity by 2025. It was therefore necessary to map existing water resources for better management of them. Such maps were being prepared with the help of remote sensing data,

particularly to identify rainwater harvesting sites for artificial recharge and to locate the critical areas where immediate watershed management action was required. Such information was provided to the local water management institutions.

82. Hector Gutiérrez of the Dirección General de Aviación Civil (Chile) reported on the establishment of a dedicated office to develop satellite applications programmes. Through that office, the air navigation system in Chile utilized information from the Global Positioning Satellite system (GPS), the COSPAS/SARSAT system, and meteorological satellites for aviation purposes. Other space activities in Chile included the FASat-BRAVO small satellite project. Mr. Gutiérrez stressed the importance of knowing when it was useful to use space technology for cost-benefit reasons.

83. Alberto Garcia Rivero of the Instituto de Geofísica y Astronomía (Cuba) made a presentation entitled "Application of Remote Sensing in Cuba: Examples in Geological Research". Cuba had started with an aerial panchromatic survey of the country in 1956-1958. The first activities involving space remote sensing had begun in 1975 in the Intercosmos framework and included the international experiments "Trópico I/II/III", "IR-87", "Caribe Intercosmos" and others. The main applications in Cuba were geological mapping and tectonic interpretation, the search for mineral deposits and the determination of geological hazards (landslides and collapses, areas that might be affected by earthquakes and floods). Currently, there was an increase in the use of GPS applications. Data and information were provided to the local government.

84. Mónica Miguel Lagos of the ESA Outreach Office made a presentation entitled "An Integrated Approach to Education on Earth Observation". The Office was integrating several efforts of ESA including: (a) "Teach and Track", to educate young people around the world on the potential benefits of space; (b) Kiteye, a project to use kites to support workshops with in-situ remote sensing for young people; and (c) the European Earth Observation Web Portal for Secondary Schools, to raise awareness on Earth observation applications among students. In its activities, ESA cooperated with the European Association for the International Space Year, which had also established outreach programmes focusing on Earth observation applications. Discussions were under way to establish cooperation with the Globe Programme of the National Aeronautics and Space Administration (United States).

85. Paul Stevens of Surrey Satellite Technology Ltd. (United Kingdom) introduced Surrey's Disaster Monitoring Constellation. Surrey aimed to establish a disaster-monitoring constellation of satellites. Currently the proposed constellation consisted of five micro-satellites (100 kg, orbit altitude of 690 km, 36-m resolution in three spectral bands, daily imaging). Each microsatellite would be funded and built by a different country; current candidates included Algeria, China, Nigeria, Thailand and the United Kingdom. Each member would be able to benefit from the entire constellation using an existing network of groundstations. Surrey and its partners planned to commercialize the operational system.

86. Olga Rasuleva of Uzbekcosmos (Uzbekistan) made a presentation entitled "Space Research and Technology Applications in Uzbekistan: Prospects of Sustainable Development". Space activities in Uzbekistan included the construction of an international radio-astronomical complex RT-70. The project was to be completed in 2005 and was seeking international partners. Uzbekcosmos organized joint ventures and activities. Funding for those activities came in part from State programmes and the rest from international partners. For instance, a conference on how to make space technology applications operational, held in 2001, was co-sponsored by the Government, the European Commission and the Gesellschaft für Angewandte Fernerkundung (GAF).

87. El Medhi Alem of the Université Mohammed V (Morocco) distributed a paper that dealt with the roles of Earth observation and education in sustainable development and presented some of Morocco's experience in dealing with the challenges of teaching remote sensing and incorporating remote sensing into scientific research objectives.

88. Fernando Stancato of the Universidad do Norte do Paraná (Brazil) reported on student rocket and small satellite projects as part of the efforts being carried out in Brazil to incorporate young students into space activities. The student group had launched a 3.5-metre rocket and would work on building a nano-satellite. The group had found an unusual source of funding from the private sector by promoting among the news media that it would broadcast the first Brazilian voice from space.

89. Tamer Özalp of Tübitak (Turkey) made a presentation entitled "Space as a Matter of Strategic Importance: National Development Policy and Plans of Turkey". Turkey's space-related activities in the public and private sector were growing, and space technology had been identified as a priority area. Space activities were coordinated by the Supreme Council for Science and Technology. A draft law had been prepared for the creation of a national space agency that would lead and coordinate space-related activities. A national space policy had been drawn up to support the agency. Turkey had started negotiations with ESA on the possibility of cooperating in some projects.

90. Erol Tunali of the Information Technologies and Electronics Research Institute (BILTEN) (Turkey) presented the BiltenSat Imaging Satellite project. BILTEN started the BiltenSat programme in August 2001. BiltenSat was a 100-kg class satellite with VHF/UHF and S-band telecommunications payloads and a 12-m resolution imager in the panchromatic region of the electromagnetic spectrum and a 26-m resolution multispectral imager. The goal of the project was to enable Turkey to design, manufacture and operate small satellites.

91. Euis Susilawati of LAPAN (Indonesia) gave a presentation entitled "The Eminent Obstacles Impeding the Maximum Possible Use of Space Technology in Indonesia". Obstacles cited for telecommunications activities were insufficient coordination between government entities and industry and the lack of a clear legal framework. For Earth observation activities, the obstacles were that there was a lack of information and awareness of the potential of remote sensing by the user community and that the private sector participated only in selling and not in adding value to the data. In space sciences, LAPAN was proposing to increase awareness at the decision-making level, increase coordination among space-related agencies, involve industry and the private sector in space activities and emphasize the cost-effectiveness of space technology.

92. Peter Martinez of the South African Astronomical Observatory (South Africa) gave a presentation entitled "Towards an Institute for Space Science in Southern Africa". The presentation reported on efforts being carried out to coordinate astronomical facilities in Southern Africa and included some of the obstacles being faced. In particular, there was a need to reduce the "brain-drain", to create synergistic activities and to promote the involvement of industry in the region.

93. Tahar Iftene of the Centre National des Techniques Spatiales (Algeria) made a presentation entitled "Desertification Sensitivity Map Realization using Remote Sensing: the Case of the Algerian Steppe", which was a pilot project aimed at establishing the local capacity to develop such maps over other areas.

94. Ahmed Sayeed of SPARRSO (Bangladesh) gave a presentation entitled "Remote Sensing and Space Applications in Bangladesh". As Bangladesh was subject to many disasters of meteorological origin, many of the applications at SPARRSO were oriented to monitoring weather patterns. Other Earth observation applications were in shrimp farming, crop monitoring, drought and water balance studies.

95. Robert Missotten of UNESCO reported on recent activities carried out to implement the Integrated Global Observing Strategy (IGOS). The work was being carried out in the framework of the IGOS Partnership, for which Committee on Earth Observation Satellites (CEOS) provided the space observation component. The aim of the Partnership was to develop an operational approach in Earth observation, integrating ground and space measurements and assuring the continuity and availability of data.

Notes

[1] See *Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 19-30 July 1999* (United Nations publication, Sales No. E.00.I.3), chap. I, resolution 1, para. 1 (e) (ii), and chap. II, para. 409 (d) (i).

[2] *Official Records of the General Assembly, Fifty-fifth Session, Supplement No. 20* and corrigendum (A/55/20 and Corr.1), para. 37.

[3] *Official Records of the General Assembly, Fifty-sixth Session, Supplement No. 20* (A/56/20), para. 133.